Patent Application Serial No. 09/657,111	)	Group No.: 2863
	)	
Filed: February 15, 2001	)	Examiner: T. Lau
	)	
Title: Event and Sport Performance Methods and Systems	)	Attorney Docket No.: 389014
	)	
Inventors: Vock et al.	)	

REDLINE SPECIFICATION – MARKED UP VERSION SHOWING CHANGES MADE IN SUBSTITUTE SPECIFICATION

Event and Sport Performance Methods and Systems

Related Applications

[0001] This application claims priority to U.S. Provisional Application No. 60/152,688, which is hereby incorporated by reference.

Field of the Invention

[0002] The invention relates to sport performance and measuring sport performance at events like the X-GAMES.

BACKGROUND OF THE INVENTION

[0003] Skiers and other athletes in sporting activities experience speed, airtime and other factors such as spin. Persons watching such athletes cannot quantitatively appreciate the actual speed, airtime and spin, for example, because the prior art does not make such measurements in a manner suitable for either the athlete or persons watching the athlete. The invention provides features to overcome the limitations of the prior art.

SUMMARY OF THE INVENTION

A. [0004] In one aspect, the invention ~~(FIG. 1)~~ provides systems and methods to monitor and gauge airtime, altitude and spin ratios for an event with a sportsman jumping into the air. For example, the US SKI team has aerial competitions where the team jumps off a ramp and lands in water. The invention of this aspect provides for measuring the time in the air (airtime), the peak altitude, and other factors such as spin ratios (how much the body spun, or how much one part of the body spun relative to other parts or relative to the sports vehicle, e.g., the ski).

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. 1 ~~(SYSTEM 10)~~ shows a system to assess movement of a sportsman;

[Note – illustration of FIG. 1 moved to FIG. 1 of substitute specification]

[0006] FIG. 2 illustrates frame-by-frame motion of the sportsman captured by the computer of FIG. 1;

[Note – illustration of FIG. 2 moved to FIG. 2 of substitute specification]

[0007] FIG. 3 illustrates 3D tracking of a sport enthusiast via triangulation; and

[0008] FIG. 4 shows stride-rate and training sensing units.

DETAILED DESCRIPTION OF THE DRAWINGS

[0009] In FIG. 1, a digital camera 12 like a SONY DCR VX1000 takes a picture of a sportsman 18 jumping off a ramp ~~20~~24. Data from the camera 12 goes to a computer 14 such as through an i-Link (IEEE 1394) or "firewire" link 15 to take digital data to the computer (those skilled in the art should appreciate that video data could alternatively be sent through the link 15 and then digitized by a frame-grabber in the computer 14.

[0010] Data taken from the computer 14 can be analyzed in a "frame by frame" technique to decipher motion of the sportsman 18 through the frames of data (typically captured at 30Hz or more), as shown in FIG. 2. U.S. Patent No. 5,798,519 provides similar processing of frame data and is thus incorporated by reference as useful for application with the invention. For example, since only the sportsman moves, the ramp 24 stays substantially fixed through the several frames of data and so it remains fixed though the sportsman moves from "start" to "stop" positions.

[0011] Altitude is determined by referencing the track 17 of the sportsman 18 relative to the object 20. Specifically, system 10 takes an image of the object 20 with a known height and compares that to the motion of the user. Trigonometric relations provide direct correlation to the user's actual height "x" along the track. By way of example, if the object 20 were a mountain at 14,000 feet, then by trigonometry ratios we know that that peak altitude of 14,000 feet corresponds to 50 feet at the sportsman's location. Another example is that an object such as a measuring tape is placed at the same location as the sportsman's track and stored in memory in the computer 14 so that the track 17 is compared relative to an actual height stored at that location through the tape. For instance, if for example ~~1~~one meter at the sportsman's position corresponds to ~~25~~twent-five pixels of imagery (either on screen or digitally, pixel by

pixel of the camera 12), then this information correlates directly to the track 17 such that height "X" is determined.

[0012] ~~B.~~ In another ~~aspect~~embodiment, the invention of FIG. 3 provides 3D tracking of a sport enthusiast via triangulation through an emitter attached with the enthusiast. In this ~~aspect~~embodiment, a radio beacon 58 is attached to the sportsman 60, and antennas 62 capture the signal 58a from the beacon 58; and this data is compared at the computer 64 to "time" the receipt of signal 58a at each antenna 62 such that the sportsman's location is known at each moment of time. This location is, over time, evaluated to determine metrics such as peak altitude, rotation of the user, drop distance and time in the air.

~~FIG. 3~~

[Note – illustration of FIG. 3 moved to FIG. 3 of substitute specification]

[0013] ~~C.~~ In another ~~aspect~~embodiment, the invention of FIG. 4 provides for stride-rate evaluations and training for sports such as roller blading. Specifically, two sensing units 72, 74 are attached to the vehicle (e.g., pair of roller blades 70, 72) as shown in FIG. 4 and these sensing units 72, 74 are evaluated by a common data unit 76 to determine stride rate and other useful sporting performance information.

[Note – illustration of FIG. 4 moved to FIG. 4 of substitute specification]

[0014] U.S. Patent No. 5,636,146 is incorporated herein by reference. ~~Appendix A, attached hereto, provides other information for purposes of disclosure, Appendix A being in the form of a PCT application by some of the inventors hereof.~~